## INTEGRATED CIRCUIT **TOSHIBA** TECHNICAL DATA

## TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT **TA8167N**

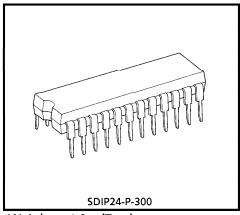
SILICON MONOLITHIC

### 3V AM / FM 1CHP TUNER IC

TA8167N is the AM/FM 1chip tuner IC, which is designed for Portable radios and 3V Headphone radios.

#### **FEATURES**

- Built-in FM F/E, AM/FM IF and FM MPX
- AM Detector Coil and IF Coupling Condenser are not needed.
- S curve characteristics of FM detection output is Reverse characteristic.
- The FM Local Oscillation Voltage is set up low relatively for measures against FM radiation.
- Operating Supply Voltage Range  $V_{CC} = 1.8 \sim 7.0 \text{V} \text{ (Ta} = 25 ^{\circ}\text{C)}$



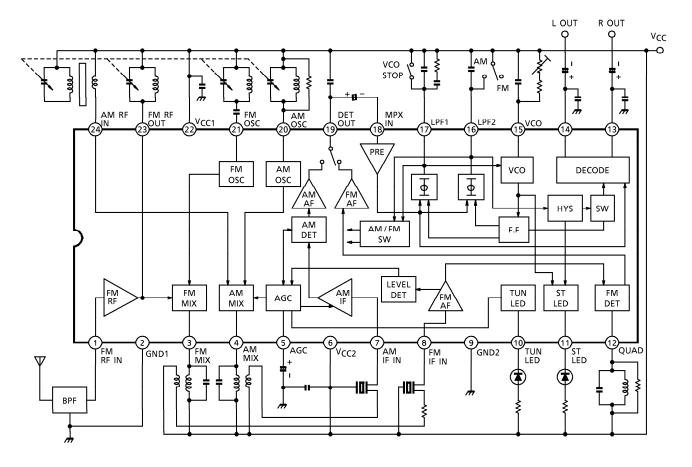
Weight: 1.2g (Typ.)

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#### **BLOCK DIAGRAM**



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## **EXPLANATION OF TERMINALS**

PIN	SYMBOL	INTERNAL CIRCUIT	DC VOLT	AGE (V) SIGNAL)
No.			AM	FM
1	FM-RF IN	FM-RF OUT (23)  GND1 (2)  GND1 (2)	0	0.7
2	GND1 (GND for RF Stage)	_	0	0
3	FM MIX	V <sub>CC1</sub> ②	3.0	3.0
4	AM MIX	V <sub>CC1</sub> (22)  (4)  (B)  (B)  (C)  (D)  (D)  (D)  (D)  (D)  (D)  (D	3.0	3.0
5	AGC (AM AGC)	IF AGC	0	0
6	V <sub>CC2</sub> (V <sub>CC</sub> for IF/MPX Stage)	_	3.0	3.0
7	AM IF IN	VCC2 6 C T T T T T T T T T T T T T T T T T T	3.0	3.0
8	FM IF IN	V <sub>CC2</sub> 6 C C C C C C C C C C C C C C C C C C	3.0	3.0

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PIN	SYMBOL	INTERNAL CIRCUIT	DC VOLTAGE (V) (AT NO SIGNAL)		
No.			AM	FM	
9	GND2 (GND for IF/MPX Stage)	_	0	0	
10	TUN LED (Tuning LED)	V <sub>CC2</sub> (6) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	_	_	
11	ST LED (Stereo LED)	76kHz ————————————————————————————————————	_	_	
12	QUAD (FM QUAD, Detector)	V <sub>CC2</sub> 6	3.0	3.0	
13 14	R-OUT (R-ch Output) L-OUT (L-ch Output)	V <sub>CC2</sub> 6 G <sub>M</sub>	1.0	1.0	
15	vco	VCC2 6 DC AMP 15 GND2 9	2.5	2.5 ( VCO STOP MODE	
16	LPF2  • LPF Terminal for Synchronous Detector • Bias Terminal for AM / FM SW Circuit V16 = VCC → AM (VCO Stop) V16 = Open → FM	GND2 9	3.0	2.2 VCO STOP MODE 2.7	
17	LPF1  ■ LPF Terminal for Phase Detector  ■ VCO Stop Terminal  V17 = VCC→VCO Stop	GND2 9	2.7	2.2	

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PIN	SYMBOL	INTERNAL CIRCUIT	DC VOLT (AT NO	AGE (V) SIGNAL)
No.			AM	FM
18	MPX IN	(B) (S) (S) (S) (S) (S) (S) (S) (S) (S) (S	0.7	0.7
19	DET OUT	VCC2 6  AM O  FM O  B  CONSTRUCTION  B  LOW-FM, HIGH-AM  COW-AMM, HIGH-FM	1.5	1.2
20	AM OSC	Vcc1 (2) MIX GND1 (2)	3.0	3.0
21	FM OSC	Vcc1 22	3.0	3.0
22	V <sub>CCL</sub> (V <sub>CC</sub> for RF Stage)	<del>_</del>	3.0	3.0
23	FM RF OUT	cf. pin①	3.0	3.0
24	AM RF IN	V <sub>CC1</sub> (2) (3) (4) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	3.0	3.0

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#### **MAXIMUM RATINGS** (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	Vcc	8	V
LED Current	ILED	10	mΑ
LED Voltage	V <sub>LED</sub>	8	٧
Power Dissipation	P <sub>D</sub> (Note)	1200	mW
Operating Temperature	T <sub>opr</sub>	<b>− 25~75</b>	°C
Storage Temperature	T <sub>stg</sub>	<b>-</b> 55∼150	°C

(Note) Derated above  $Ta = 25^{\circ}C$  in the proportion of  $9.6 \text{mW}/^{\circ}C$ .

#### **ELECTRICAL CHARACTERISTICS**

Unless otherwise specified, Ta = 25°C,  $V_{CC}$  = 3V, F/E : f = 83MHz,  $f_m$  = 1kHz

FM IF : f = 10.7MHz,  $\Delta f$  =  $\pm$  22.5kHz,  $f_m$  = 1kHz

AM : f = 1MHz, MOD = 30%,  $f_m$  = 1kHz

MPX :  $f_m$  = 1kHz

	CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sunn	ly Current	ICC (FM)	1	V <sub>in</sub> = 0, FM Mode	_	13.2	20.0	mA
Supp	ny Current	<sup>I</sup> CC (AM)	1	V <sub>in</sub> = 0, AM Mode		8.4	13.5	l IIIA
F/E	Input Limiting Voltage	V <sub>in</sub> (lim)	1	- 3dB Limiting	1	10.0	_	dBμV EMF
	Local OSC Voltage	Vosc	2	f <sub>OSC</sub> = 72.3MHz	_	70	_	$mV_{rms}$
	Input Limiting Voltage	V <sub>in</sub> (lim) IF	1	– 3dB Limiting	40	46	53	dBμV EMF
	Recovered Output Voltage	V <sub>OD</sub>	1	V <sub>in</sub> = 80dBμV EMF	55	80	110	mV <sub>rms</sub>
FM	Signal To Noise Ratio	S/N	1	$V_{in} = 80 dB \mu V EMF$	_	70	—	dB
IF	Total Harmonic Distortion	THD	1	V <sub>in</sub> = 80dBμV EMF	_	0.4	_	%
	AM Rejection Ratio	AMR	1	V <sub>in</sub> = 80dBμV EMF	_	32	_	dB
	Lamp ON sensitivity	VL	1	I <sub>L</sub> = 1mA	45	51	56	dBμV EMF
	Gain	GV	1	$V_{in} = 26 dB \mu V EMF$	40	70	110	$mV_{rms}$
	Recovered Output Voltage	V <sub>OD</sub>	1	V <sub>in</sub> = 60dBμV EMF	55	80	110	mV <sub>rms</sub>
АМ	Signal To Noise Ratio	S/N	1	$V_{in} = 60 dB \mu V EMF$		42	—	dB
	Total Harmonic Distortion	THD	1	V <sub>in</sub> = 60dBμV EMF	_	1.0	_	%
	Lamp ON Sensitivity	VL	1	I <sub>L</sub> = 1mA	20	25	30	dBμV EMF
Pin®	Output Resistance	R <sub>19</sub>		FM Mode AM Mode		0.75 12.5	_ _	kΩ

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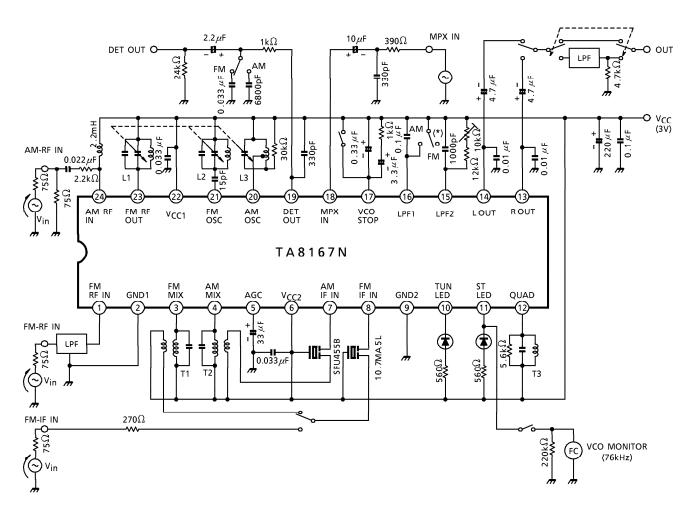
## **TA8167N**

	CHARACTERISTIC SYMBOL CIR- CUIT TEST CONDITION		MIN.	TYP.	MAX.	UNIT				
	Input Resis	tance	R <sub>IN</sub>	_	_		_	24	-	kΩ
İ	Output Res	sistance	ROUT	_	_		_	5	—	kΩ
	Max. Comp Signal Inpu		V <sub>in max</sub> (STEREO)	1	L + R = 90%, P = f <sub>m</sub> = 1kHz, THD		_	350	_	mV <sub>rms</sub>
					L+R	f <sub>m</sub> = 100Hz	_	42	_	
	Separation		Sep	1	= 135mV <sub>rms</sub>	f <sub>m</sub> = 1kHz	35	42	-	dB
					$P = 15 \text{mV}_{\text{rms}}$	f <sub>m</sub> = 10kHz	_	42	_	
MPX			THD (MONAURAL)	4	V <sub>in</sub> = 150mV <sub>rms</sub>		_	0.2	_	0/
	Harmonic Distortion	Stereo	THD (STEREO)	1	$L + R = 135 \text{mV}_{rm}$ $P = 15 \text{mV}_{rms}$	ns,	_	0.2	_	%
	Voltage Gain		G <sub>V</sub> (MPX)	1	V <sub>in</sub> = 150mV <sub>rms</sub>		- 5	-3	- 1	dB
-	Channel Ba	alance	C.B.	1	V <sub>in</sub> = 150mV <sub>rm</sub>	s	- 2	0	2	dB
	Stereo Lan	np ON	V <sub>L</sub> (ON)	1	Dilat lanut			8	16	m\/
	Sensitivity	OFF	V <sub>L</sub> (OFF)	'	Pilot Input		2	6	—	mV <sub>rms</sub>
	Stereo Lamp Hysteresis		V <sub>H</sub>	1	To LED turn of turn on	ff from LED	_	2		mV <sub>rms</sub>
	Capture Ra	nge	C.R. 1 P = 15mV <sub>rms</sub>			_	±3	<u> </u>	%	
	Signal To I	Noise Ratio	S/N	1			_	70	_	dB

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#### **TEST CIRCUIT 1**



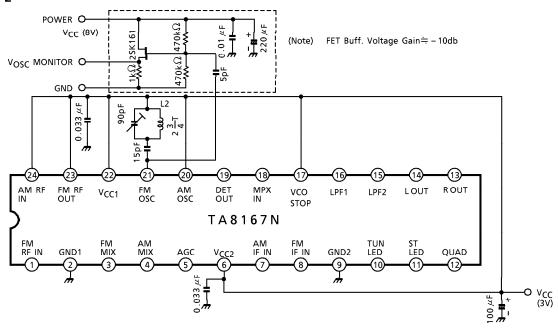
#### (\*) POLYESTER FILM CONDENSER

Using other types of condensers, there are some cases that the MPX does not do normal stereo action at high temperature or low temperature.

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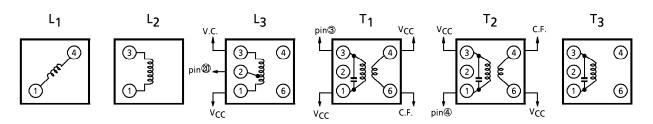
#### **TEST CIRCUIT 2**



#### **COIL DATA**

COIL No.	TEST	L	Co	Co			TURNS	1		WIRE	DEFEDENCE
COIL NO.	o. FREQ. μH)	(μH)	(pF)	Qo	1-2	2-3	1-3	1-4	4-6	$(mm\phi)$	REFERENCE
L <sub>1</sub> FM RF	100M	_	1	100	_	_	_	$2\frac{1}{2}$		0.5UEW	\$\sqrt{53T-037-202}
L <sub>2</sub> FM OSC	100M	_		100	_	_	$2\frac{3}{4}$	_		0.5UEW	© 0258-244
L <sub>3</sub> AM OSC	796k	288	_	115	13	73		_	_	0.08UEW	<b>\$ 4147-1356-038</b>
T <sub>1</sub> FM MIX	10.7M	_	75	100	_	_	13	_	2	0.1UEW	© 2153-414-041
T <sub>2</sub> AM MIX	455k	_	180	120	_	_	180	_	15	0.08UEW	© 2150-2162-165
T <sub>3</sub> FM DET	10.7M		47	165	_	_	16	_	_	0.09UEW	<u>\$ 2153-4095-122</u>

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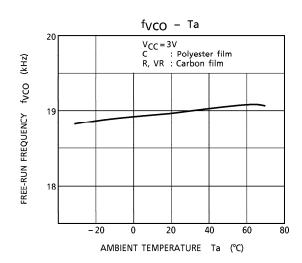
#### HINT ON USE OF TA8167N

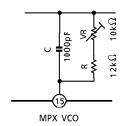
- O External parts of MPX VCO
  - (1) Temperature characteristic of MPX VCO free-run frequency.

The temperature characteristic of MPX VCO is shown in the diagram as below.

Select one with a better temperature characteristic (C, R and VR.) in use. We recommend,

(C : POLYESTER FILM R, VR.: CARBON FILM





(2) Value of the external parts

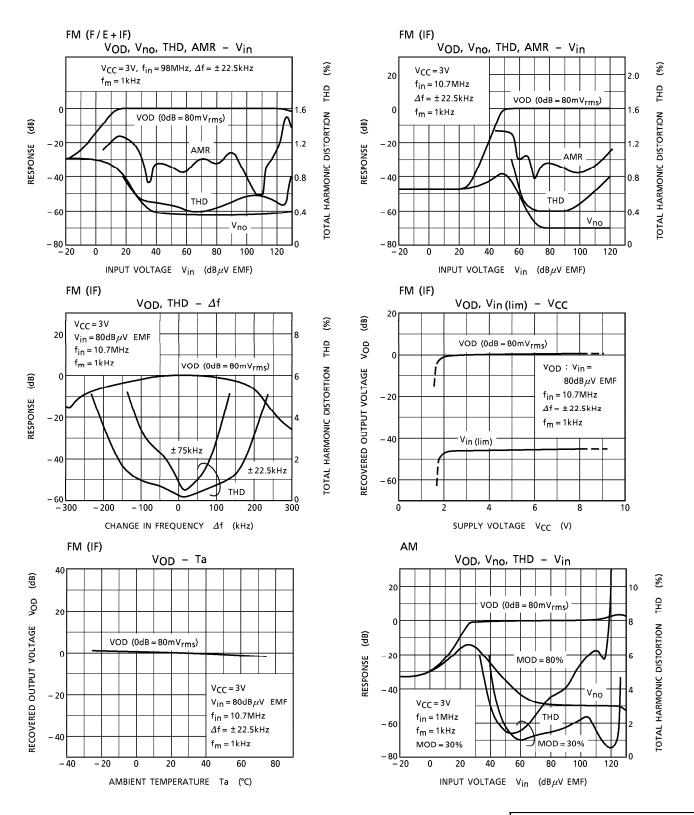
We recommend to set up these value as below.

$$C = 1000 pF$$
 $R = 12k\Omega$ 
 $VR = 10k\Omega$ 

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#### TA8167N



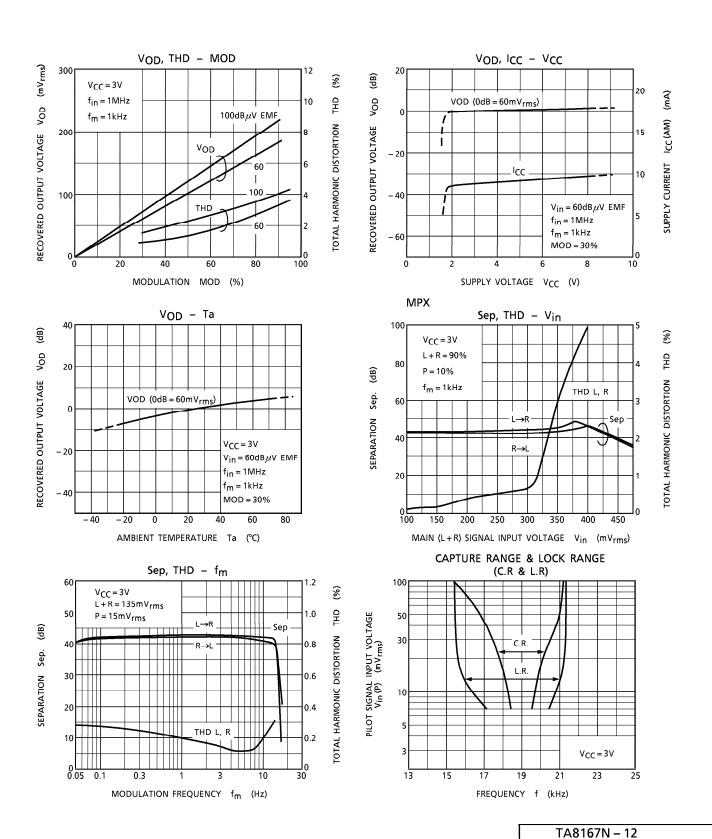
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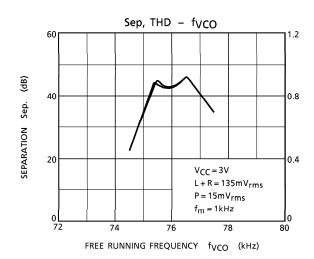
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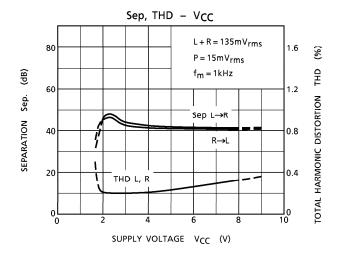
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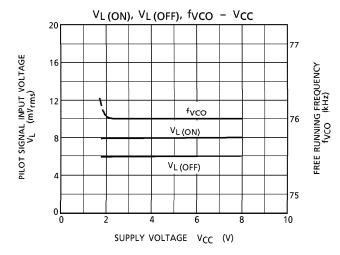


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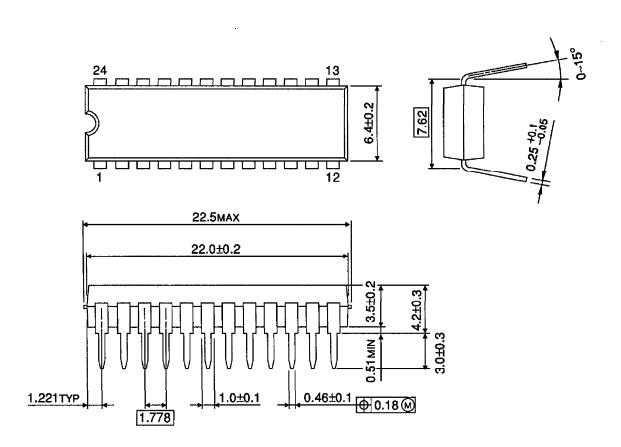
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## **TA8167N**



Unit: mm



Weight: 1.2g (Typ.)

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